# *Flammable and Combustible Liquids*

# Introduction

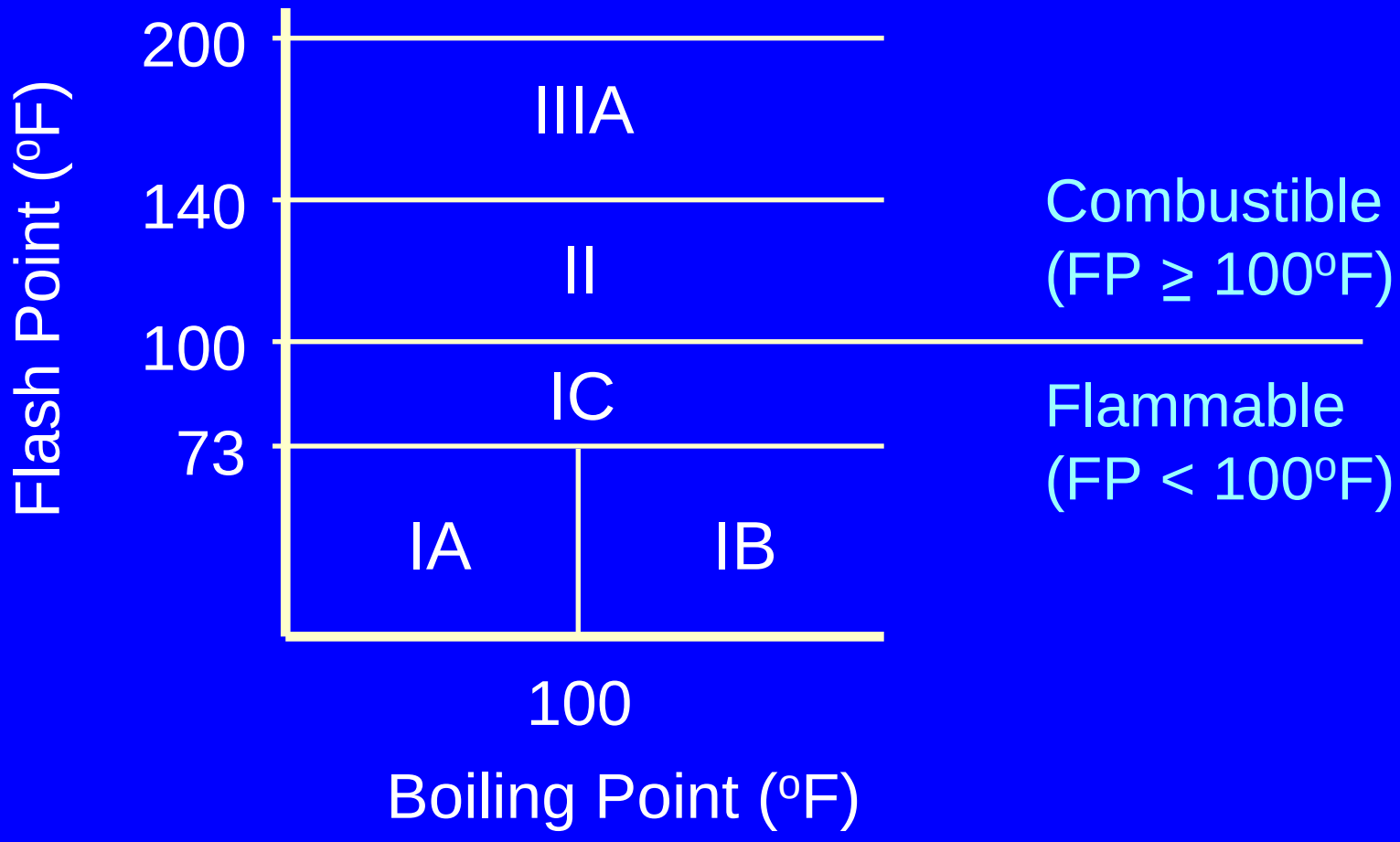
- Primary hazards
  - *explosion* and *fire*

- Safe handling and storage
  - approved equipment and practices per OSHA standards
    - 8CCR section 5531 et. al.

# Flash Point

- Flash point
  - minimum temperature at which a liquid gives off enough vapor to form an ignitable mixture
  - the lower the flash point, the greater the hazard
- OSHA and NFPA
  - Flammable liquids have flash points below 100$^{o}$F
  - Combustible liquids have flash points above 100$^{o}$F
- DOT
  - Flammable liquids have flash points below 141$^{o}$F
  - Flammable liquids have flash points above141$^{o}$F

# Classes of Flammable and Combustible Liquids



# Classes of Some Flammable Liquids

| | Common Name | Flash Point (°F) |
|---|---|---|
| **CLASS IA** | Ethyl Ether | -49 |
| **CLASS IB** | Gasoline | -45 |
| | Methyl Ethyl Ketone | 21 |
| | Toluene | 40 |
| **CLASS IC** | Xylene | 81-115 |
| | Turpentine | 95 |

# Program Components

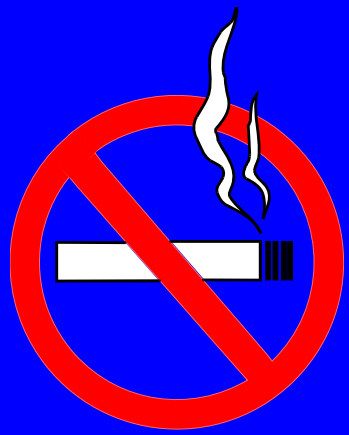
A good plan for safe use of flammable and combustible liquids contains at least these components:

- Control of ignition sources
- Proper storage
- Fire control
- Safe handling

# Sources of Ignition

Must take adequate precautions to prevent ignition of flammable vapors. Some sources of ignition include:

- Open flames
- Smoking
- Static electricity
- Cutting and welding
- Hot surfaces
- Electrical and mechanical sparks
- Lightning



# Static Electricity

- Generated when a fluid flows through a pipe or from an opening into a tank

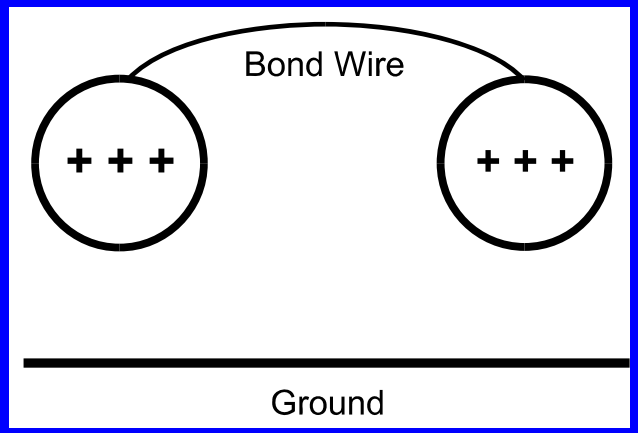
- Main hazards are fire and explosion from sparks containing enough energy to ignite flammable vapors

- Bonding or grounding of flammable liquid containers is necessary to prevent static electricity from causing a spark

# Bonding

- Physically connect two conductive objects together with a bond wire to eliminate a difference in static charge potential between them

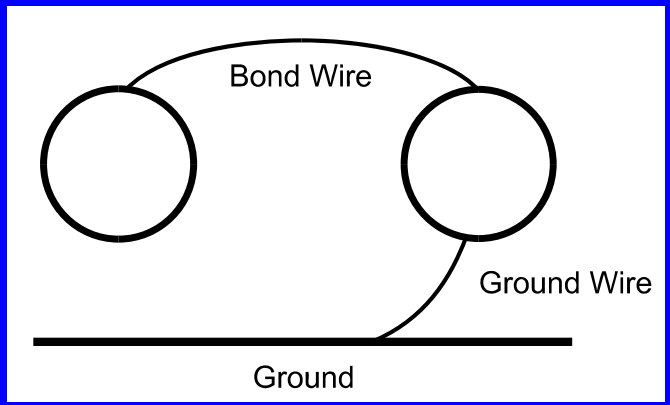
- Must provide a bond wire between containers during flammable liquid filling operations, unless a metallic path between them is otherwise present



# Grounding

- Eliminates a difference in static charge potential between conductive objects and ground

- Although bonding will eliminate a difference in potential between objects, it will not eliminate a difference in potential between these objects and earth unless one of the objects is connected to earth with a ground wire



# Ventilation

Always provide adequate ventilation to reduce the potential for ignition of flammable vapors.

# Storage Fundamentals

- Identify incompatible chemicals – check the Material Safety Data Sheet
- Isolate and separate incompatible materials
  - Isolate by storing in another area or room
  - Degree of isolation depends on quantities, chemical properties and packaging
  - Separate by storing in same area or room, but apart from each other

# Storage of Flammable and Combustible Liquids

- Storage must not limit the use of exits, stairways, or areas normally used for the safe egress of people
- In office occupancies:
  - Storage prohibited except that which is required for maintenance and operation of equipment
  - Storage must be in:
    - closed metal containers inside a storage cabinet, or
    - safety cans, or
    - an inside storage room

*Inside storage room*

# Safety Cans for Storage and Transfer

- Approved container of not more than 5 gallons capacity
- Spring-closing lid and spout cover
- Safely relieves internal pressure when exposed to fire

# Flame Arrester Screen

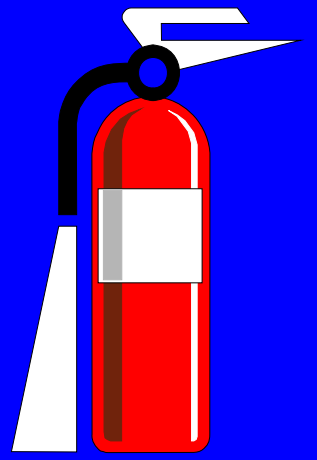
- Prevents fire flashback into can contents
- Double wire-mesh construction
- Large surface area provides rapid dissipation of heat from fire so that vapor temperature inside can remains below ignition point

# Storage Cabinets

- Not more than 60 gal of Class I and/or Class II liquids, or not more than 120 gal of Class III liquids permitted in a cabinet
- Must be conspicuously labeled, “Flammable - Keep Fire Away”
- Doors on metal cabinets must have a three-point lock (top, side, and bottom), and the door sill must be raised at least 2 inches above the bottom of the cabinet

# Fire Control

- Suitable fire control devices, such as small hose or portable fire extinguishers must be available where flammable or combustible liquids are stored
- Open flames and smoking must not be permitted in these storage areas
- Materials which react with water must not be stored in the same room with flammable or combustible liquids



# Transferring Flammable Liquids

Since there is a sizeable risk whenever flammable liquids are handled, OSHA allows only four methods for transferring these materials:

1. Through a closed piping system
2. From safety cans
3. By gravity through an approved self-closing safety faucet
4. By means of a safety pump

# Self-Closing Safety Faucet

- Bonding wire between drum and container
- Grounding wire between drum and ground
- Safety vent in drum

# Safety Pump

- Faster and safer than using a faucet
- Spills less likely
- No separate safety vents in drum required
- Installed directly in drum bung opening
- Some pump hoses have integral bonding wires

# Waste and Residue

Combustible waste and residue must be kept to a minimum, stored in covered metal receptacles and disposed of daily.

Waste drum with disposal funnel

Safety disposal can

Oily-waste can (self-closing lid)

# Safe Handling Fundamentals

- Read label on the flammable liquid container before storing or using
- Practice good housekeeping
- Clean up spills immediately
- Only use approved or original container to store flammable liquids
- Keep the containers closed when not in use and store away from exits or passageways
- Use flammable liquids only where there is plenty of ventilation
- Keep flammable liquids away from ignition sources such as open flames, sparks, smoking, cutting, welding, etc.

# Summary

- The two primary hazards associated with flammable and combustible liquids are explosion and fire
- Safe handling and storage of flammable liquids requires the use of approved equipment and practices per OSHA standards
- An excellent reference on this topic is National Fire Protection Association Standard No. 30, *Flammable and Combustible Liquids Code*